

AMENDMENTS TO THE CLAIMS

1. (Canceled) .
2. (Canceled)
3. (Previously Presented) The system of Claim 11, wherein the redirecting member is collapsible to cover the discharge opening during insertion.
4. (Previously Presented) The system of Claim 3, wherein the redirecting member is collapsible to partially cover the discharge opening during insertion.
5. (Previously Presented) The system of Claim 11, wherein the redirecting member is actuatable to a pre-defined shape.
6. (Previously Presented) The system of Claim 11, wherein the tip portion comprises a plurality of discharge openings.
7. (Currently Amended) A percutaneous cannula for discharging blood within a patient's vasculature, the cannula comprising:
 - an elongate body having a proximal end, a distal end, and ~~main cannula portion~~ comprising a blood flow lumen extending therethrough from an inlet located adjacent to the proximal end toward the distal end; and
 - ~~a tip portion extending from the main cannula portion to a distal end of the cannula, the tip portion comprising:~~
 - the cannula also comprising:
 - a plurality of discharge openings fluidly coupled with the blood flow lumen and located distal of the inlet; and
 - a plurality of redirecting members each comprising an expandable member configured to expand under the pressure of the blood flow directed through the discharge openings such that at least a portion of the expandable member is spaced from the discharge ~~opening~~ openings by a greater amount than prior to such expansion, the expandable member presenting a concave redirecting surface to blood flowing through the discharge ~~opening~~ openings when expanded, the

redirecting members configured to direct blood flow being discharged through the discharge openings proximally along the cannula.

8. **(Currently Amended)** The cannula of Claim 7, wherein the discharge openings are uniformly spaced radially around a distal ~~the tip~~ portion of the elongate body.

9. **(Currently Amended)** The cannula of Claim 7, wherein the blood flow lumen comprises a first blood flow lumen and wherein the ~~main cannula portion~~ elongate body further comprises a second blood flow lumen through which blood can be withdrawn from the vasculature.

10. **(Currently Amended)** An extracardiac pumping system for supplementing blood circulation in a patient, the extracardiac system comprising:

a pump configured to pump blood at subcardiac flow rates; and

a percutaneous cannula for discharging blood within a patient's vasculature, the percutaneous cannula fluidly linking the pump to the patient's vasculature, the cannula comprising:

a main cannula portion comprising a blood flow lumen extending therethrough, the blood flow lumen comprising a first blood flow lumen having a proximal end fluidly coupled to the pump, the main cannula portion defining an inlet of the first blood flow lumen, and wherein the main cannula portion further comprises a second blood flow lumen through which blood can be withdrawn from the vasculature; and

a tip portion extending from the main cannula portion to a distal end of the ~~cannula~~ first blood flow lumen, the tip portion comprising:

a plurality of discharge openings located distal of the inlet; and

a redirecting member comprising an expandable member configured to expand under the pressure of the blood flow directed through the discharge ~~opening~~ openings such that at least a portion of the expandable member is spaced from the discharge ~~opening~~ openings by a greater amount than prior to such expansion, the expandable member

presenting a concave redirecting surface to blood flowing through the discharge ~~opening~~ openings when expanded, the redirecting member configured to direct blood flow being discharged through the discharge opening proximally along the cannula.

11. **(Currently Amended)** An extracardiac pumping system for supplementing blood circulation in a patient, the extracardiac system comprising:

a pump configured to pump blood at subcardiac flow rates;

an inflow conduit fluidly coupled to the pump and configured to direct blood to the pump from a first vascular site; and

a percutaneous cannula for discharging blood within a patient's vasculature, the percutaneous cannula fluidly linking the pump to a second vascular site, the cannula comprising:

a main cannula portion comprising a blood flow lumen extending therethrough and an inlet configured to provide fluid flow into the blood flow lumen; and

a tip portion extending from the main cannula portion to a the distal end of the cannula, the tip portion comprising:

a discharge opening located distal of the inlet; and

a redirecting member comprising an expandable member configured to expand under the pressure of the blood flow directed through the discharge opening such that at least a portion of the expandable member is spaced from the discharge opening by a greater amount than prior to such expansion, the expandable member presenting a concave redirecting surface to blood flowing through the discharge opening when expanded, the redirecting member configured to direct blood flow being discharged through the discharge opening proximally along the cannula.

12. **(Previously Presented)** The system of Claim 11, wherein the cannula further comprises a tapered portion proximate the distal end of the cannula.

Appl. No. : 10/706,346
Filed : November 12, 2003

13. **(Previously Presented)** The system of Claim 11, further comprising a surface extending across the blood flow lumen, the surface configured to direct blood through the discharge opening.

14. **(Previously Presented)** The system of Claim 13, wherein a guidewire lumen extends between the surface and the distal end.

15. **(Previously Presented)** The system of Claim 14, further comprising sealing means configured to minimize the blood flow through the guidewire lumen when the cannula is in operation.

16. **(Previously Presented)** The system of Claim 15, further comprising a valve located in the guidewire lumen.

17. **(Previously Presented)** The system of Claim 15, further comprising a plug located in the guidewire lumen.

18. **(Previously Presented)** The system of Claim 11, further comprising a recess at the distal end of the cannula and configured to receive a guide-member.

19. **(Previously Presented)** The system of Claim 18, further comprising a guide-member embedded in the recess.

20. **(Previously Presented)** The system of Claim 19, wherein the blood flow lumen comprises a first blood flow lumen and wherein the main cannula portion further comprises a second blood flow lumen through which blood can be withdrawn from the vasculature.

21. **(Previously Presented)** The system of Claim 11, further comprising a gap extending between a proximal edge of the redirecting member and a proximal edge of the discharge opening through which blood may flow.

22.-85. **(Canceled)**

86. **(Previously Presented)** The system of Claim 11, wherein the expandable member has a distal end and a proximal end adjacent to a proximal end of the discharge opening, the proximal end of the expandable member comprising a continuous perimeter extending substantially entirely around the outside portion of the tip portion.

87. **(Previously Presented)** The system of Claim 11, wherein the expandable member has a proximal end with a perimeter, the expandable member having a contracted configuration in which the perimeter has a first length and an expanded configuration in which the perimeter has a second length, the second length being greater than the first length.

88. **(Previously Presented)** The system of Claim 11, wherein the tip portion is configured to direct blood flow in the direction generally opposite to the direction of blood flow in the lumen, and wherein the tip portion further comprises a surface extending across the blood flow lumen to direct blood through the discharge opening.

89. **(Previously Presented)** The system of Claim 88, wherein the surface is curved.

90. **(Previously Presented)** The system of Claim 89, wherein the surface is spherical or parabolic.

91. **(Previously Presented)** The system of Claim 11, where the redirecting member comprises a flap larger than the discharge opening.

92. **(Previously Presented)** The system of Claim 91, wherein the redirecting member is collapsible to cover at least a portion of the discharge opening during insertion into the vasculature.

93. **(Previously Presented)** The system of Claim 92, wherein a portion of the discharge opening is uncovered when the redirecting member is collapsed.

Appl. No. : 10/706,346
Filed : November 12, 2003

94. **(Previously Presented)** The system of Claim 92, wherein the discharge opening is fully covered when the redirecting member is collapsed.

95. **(Previously Presented)** The system of Claim 92, wherein the redirecting member is collapsed onto a surface recessed into the outer wall of the cannula.

96. **(Previously Presented)** The system of Claim 11, wherein the redirecting member is expandable to uncover the discharge opening.

97. **(Previously Presented)** The system of Claim 96, wherein a distal-to-proximal dimension of the redirecting member is smaller than a distal-to-proximal dimension of the discharge opening.

98. **(Previously Presented)** The system of Claim 96, wherein a distal-to-proximal dimension of the redirecting member is approximately equal to a distal-to-proximal dimension of the discharge opening.

99. **(Currently Amended)** The cannula of Claim 7, wherein at least one of the redirecting members comprises an expandable member having a distal end and a proximal end adjacent to a proximal end of a corresponding one of the discharge opening openings, at least two sides of the expandable member being connected to a distal the tip portion of the elongate body.

100. **(Previously Presented)** The cannula of Claim 99, wherein the expandable member has a proximal end with a perimeter, the expandable member having a contracted configuration in which the perimeter has a first length and an expanded configuration in which the perimeter has a second length, the second length being greater than the first length.

101. **(Currently Amended)** The cannula of Claim 7, ~~wherein the tip portion~~ further ~~comprises~~ comprising a surface extending across the blood flow lumen, the surface configured to direct blood through the discharge openings.

Appl. No. : 10/706,346
Filed : November 12, 2003

102. **(Previously Presented)** The cannula of Claim 101, wherein the surface is curved.

103. **(Previously Presented)** The cannula of Claim 102, wherein the surface is spherical or parabolic.

104. **(Previously Presented)** The system of Claim 11, wherein the main cannula portion is comprised of a first material and the redirecting member is comprised of a second material.

105. **(Previously Presented)** The system of Claim 104, wherein the second material comprises silicone.

106. **(Previously Presented)** The system of Claim 105, wherein the second material has a hardness of less than about 15 measured on an A scale durometer.

107. **(Currently Amended)** The system of Claim 11, wherein the discharge opening has [[_]]a first area; and wherein the expandable member of the redirecting member presents a second area greater than the first area when expanded.

108. **(Previously Presented)** The system of Claim 107, wherein the expandable member has a proximal end with a perimeter, the expandable member having a contracted configuration in which the perimeter has a first length and an expanded configuration in which the perimeter has a second length, the second length greater than the first length.

109. **(Previously Presented)** The system of Claim 107, wherein the expandable member extends continuously around the outside perimeter of the tip portion.